REMARKS

Status of the Claims

Claims 14-19 and 21-28 are currently pending. Claims 25-28 have been withdrawn by the Office as being drawn to nonelected inventions. Claims 14-19 and 21-24 have been examined on the merits and rejected.

In this amendment, claims 14, 18, 19 and 24 have been amended to clarify the invention. Support for the amendment is found throughout the application as filed, for example, at paragraphs [2], [23], [55]-[57], in Examples 3 and 4 (especially paragraphs [83]-[86] and [88]-[94]), and in Figures 6A-6AJ. Thus, no new matter has been added. Moreover, as explained in more detail below, claims 25-28 may be rejoined with claims 14-19 and 21-24 as a direct consequence of the amendment to claims 14 and 19. Accordingly, upon entry of the amendment, claims 14-19 and 21-28 will be subject to further examination. Entry of the amendment and reconsideration on the merits in view of the following comments are respectfully requested.

Withdrawal of Claims 25-28

Claims 25-28 have been withdrawn by the Office as being drawn to nonelected inventions. The Office based this decision on the fact that claims 14 and 19 were allegedly directed to methods of producing polyketide molecules whereas claims 25-28 were directed to polyketide synthase (PKS) genes produced by the methods of claims 14, 18, 19 and 24, respectively.

Claims 14 and 19 are amended herein to specify that the claims are directed to methods of designing and producing PKS genes. As a direct consequence of this amendment, claims 25-28 are now legitimate product-by-process claims that are properly drawn to the elected invention group. Accordingly, rejoinder of claims 25-28 is respectfully requested.

Objection to the Specification

The specification has been objected to because of a minor typographical error in line 5 on page 2. Applicants have amended the specification to correct this unintentional error. Accordingly, it is requested that this formal objection be withdrawn.

Claim Rejection under 35 U.S.C. § 101

Claim 24 has been rejected under 35 U.S.C. § 101 because the claimed invention is allegedly directed to non-statutory subject matter. Specifically, the Office has taken the position that a person skilled in the art would interpret the expression "computer readable medium" as encompassing a carrier wave, which is a signal and therefore constitutes nonstatutory subject matter under the current law.

Claims 19 and 24 are amended herein to clarify that the computer readable medium is "tangible", i.e., it does not encompass an electromagnetic carrier wave. Written support for this amendment is found, for example, in paragraph [2], starting at page 1, line 10 of the original application, wherein it is indicated that the disclosure of the present application includes a computer program listing appendix on a CD (i.e., compact disc), containing appendices A, B and D, which are incorporated by reference. Additionally, paragraph [71] on page 24 indicates that the illustrative MORPH program of the invention is a command-line driven program runs on a UNIX system, which inherently suggests that the program is embodied on a tangible computer readable medium such as a hard drive, RAM, or a removable form of storage (a CD-ROM, a floppy disk, flash memory, a tape drive, etc.). In a recent post-*Bilski* decision, the Board of Patent Appeals and Interferences confirmed this claim type as patentable even after *In re Nujten*:

> It has been the practice for a number of years that a "Beauregard Claim" of this nature be considered statutory at the USPTO as a product claim. (MPEP 2105.01, I). Though not finally adjudicated, this practice is not inconsistent with *In re Nuijten*. Further, the instant claim presents a number of software components, such as the claimed logic processing module, configuration file processing module, data organization module, and data display organization module, that are embodied upon a computer readable medium. This

> combination has been found statutory under the teachings of *In re Lowry*, 32 F.3d 1579 (Fed. Cir. 1994). In view of the totality of these precedents, we decline to support the rejection under 35 U.S.C. § 101.
>
> (*Ex parte Bo Li*, Appeal 2008-1213 (BPAI 2008) at page 9, emphasis added.)

Accordingly, it is respectfully submitted that claim 24 as amended constitutes patentable subject matter, and therefore this rejection under 35 U.S.C. § 101 may properly be withdrawn.

Claim Rejection under 35 U.S.C. § 112, First Paragraph

Claims 14-19 and 21-24 are rejected under 35 U.S.C. § 112, first paragraph, as allegedly failing to comply with the written description requirement.

The Office asserts that independent claims 14, 18 and 19 recite the limitation "wherein the database comprises at least one second string of alphanumeric symbols representing a known polyketide, and wherein each alphanumeric symbol in the second string represents a monomer unit of the known polyketide." The Office alleges that "while what the specification seems to disclose that the database comprises modules or portions of known PKS genes, which encode PKS enzymes for the synthesis of polyketide, the specification does not disclose that the database comprises string of alphanumeric symbols representing a known polyketide, and each alphanumeric symbol in the string represents a monomer unit of the known polyketide." The Office argues that "disclosing structure of the PKS genes would not be an adequate disclosure of the structure of the polyketide". (The OA at page 5).

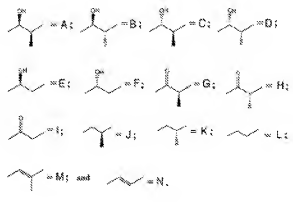
The Office further alleges that the limitation "using the third string representing the PKS gene to produce the desired polyketide" lacks adequate support in the specification because "the specification appears to describe throughout how to design and produce a PKS gene, which encodes a PKS enzyme" yet "does not adequately disclose producing the polyketides themselves." (The OA at page 6). Additionally, the Office argues that claim 24 lacks adequate written description because the specification allegedly "does not reveal any computer instructions for producing polyketide, which is step (f) of claim 14". (*Id.*)

As an initial matter, step f) of claims 14 and 19 as amended is directed to producing the PKS gene instead of the desired polyketide, thereby rendering the second and third ground for rejection moot. With regard to the first rationale, namely that "the specification does not disclose that the database comprises string of alphanumeric symbols representing a known polyketide, and each alphanumeric symbol in the string represents a monomer unit of the known polyketide," Applicants respectfully traverse this rejection for the reasons set forth below.

There is a strong presumption that an adequate written description of the claimed invention is present when the application is filed. *In re Wertheim*, 541 F.2d 257, 263, 191 USPQ 90, 97 (CCPA 1976). To satisfy the written description requirement, a patent specification must describe the claimed invention in sufficient detail that one skilled in the art can reasonably conclude that the inventor was in possession of the claimed invention. *Vas-Cath, Inc. v. Mahurkar*, 935 F.2d 1555, 1563, 19 USPQ2d 1111, 1116 (Fed. Cir. 1991), emphasis added.

The present application is replete with teachings of a database comprising strings of alphanumeric symbols that represent known polyketide, wherein each alphanumeric symbol in the strings represents a monomer unit of the known polyketide. The Office is respectfully referred to the following passages from the specification (emphasis added):

> **[45]** In another aspect of the present invention, a database of polyketides is provided. In one aspect of the present invention, the polyketides are represented by a string of defined monomers. In one embodiment, the monomers are selected from a group consisting of:



[48] In an illustrative embodiment, the polyketide database consists of the polyketides described in current literature (Journal of Antibiotics (1981-present), Journal of Natural Products) and various databases (Chemical Abstracts CAPlus, AntiBase). All unique macrocyc1ic polyketides are converted to the modified CHUCKLES format. Of the ~1000 novel polyketides obtained, only ~200 different strings of monomers and unique macrocyc1es are needed to represent the much larger collection of polyketides in the database, because many of the differences between the naturally-occurring polyketides are due to different glycosyl (sugar) groups attached at different positions on the macrocycle.

[49] Thus, a macrocyclic polyketide can be converted to a string of 2-carbon monomers by mapping the monomers onto the polyketide. This can be performed manually or with computer assistance…

[53] After a particular 2-carbon unit is identified, the next two carbons are processed the same way. This is repeated until all the backbone carbons are identified and labeled as monomers. When all two-carbon units are identified, one has generated an ordered sequence, or string, of monomers, which is a modified CHUCKLES string of the invention. Moieties corresponding to post-PKS modifications are appended to the monomer in the string as an annotation in parentheses. This method of sequencing may be extended to include any type of monomer. Figure 5 shows a flow chart of this matching method for the generation of the CHUCKLES strings used for all polyketides in a library.

[55] Thus, the present invention provides methods and computational analysis tools for designing PKS genes to produce a desired polyketide. As an illustrative example, the present invention provides a computer program termed MORPH (see the Examples below) that can read the coded library (see the Examples below). An illustrative coded library consists of ~200 unique polyketide CHUCKLES strings. The user specifies the target polyketide, which is converted from molecular structure to a CHUCKLES string.

[59] This CHUCKLES-coded polyketide library can be stored in a computer file as a set of records. In one embodiment, each record contains the chemical name of the polyketide, the unannotated CHUCKLES (containing basic macrocyclic monomers), the annotated CHUCKLES (containing basic macrocyclic monomers with information about post-PKS modifications), the producing organism(s), and other information (e.g., linearized representation of the polyketide structure, the accession number of organisms or plasmids that have been deposited, gene sequence information, and references).

Illustrative Polyketide Library

[78] This example provides the contents of an illustrative CHUCLKES [*sic*] encoded polyketide library. The first column provides the name of the polyketide; the second the CHUCKLES string; the third the annotated CHUCKLES string; and the fourth the source organism. Entries under annotated CHUCKLES and source organism are not complete for all of the polyketides.

The Office is further referred to Figures 6A-6AJ and to the table on pages 27-34, which disclose approximately 200 known polyketides along with their corresponding CHUCKLES strings (i.e., strings of alphanumeric symbols that represent 2-carbon monomers). Moreover, as noted above, the application is accompanied by a CD appendix containing an actual polyketide database wherein each known polyketide is represented by an alphanumeric string as illustrated in the table on pages 27-34 of the specification and in Figures 6A-6AJ. Based on this extensive disclosure, a person skilled in the art would easily conclude that Applicants were in possession of the claimed invention at the time the present application was filed.

In view of this ample disclosure, Applicants are thoroughly perplexed by the Office's position that the specification is lacking adequate written description for a database comprising strings of alphanumeric symbols that represent a known polyketide, wherein each alphanumeric symbol in the strings represents a monomer unit of the known polyketide. Because the specification so clearly and unequivocally supports a database comprising strings of alphanumeric symbols that represent known polyketides, wherein each alphanumeric symbol in the strings represents a monomer unit of the known polyketides, it is respectfully submitted that this rejection under 35 U.S.C. § 112, first paragraph may properly be withdrawn.

Claim Rejection under 35 U.S.C. § 112, First Paragraph

Claims 14-19 and 21-24 are rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The Office asserts that the preambles of independent claims 14 and 19 recite a "method of designing and producing a polyketide synthase (PKS) gene," but the claims do not actually produce the PKS gene. Further, the Office states that the first and second strings in steps (a) and (b) both represent a known polyketide, and the common symbols between the first and second strings identified in step (c) therefore should represent the monomer units of polyketide. However, the third string generated in step (d), which comprises the common symbols identified in step (c), represents the structure of a PKS gene. The Office argues that it is unclear as to how a string comprising the common symbols of two strings that represent polyketide could represent a PKS gene, which encodes a PKS enzyme that catalyzes the synthesis of polyketide.

As an initial matter, steps d) and f) of claims 14 and 19 are amended to read as follows: "generating a third string, wherein the third string comprises the name of the known polyketide and the common alphanumeric symbol or continuous sequence of alphanumeric symbols identified from step (c), and wherein the third string represents the structure of a PKS gene encoding a PKS enzyme capable of producing the desired polyketide" and "using the third string to produce the PKS gene".

Thus, claims 14 and 19 as amended are directed to methods of producing a PKS gene, thereby rendering the first rejection moot.

With regard to the second rejection, claims 14 and 19 as amended specify that the third string comprises the name of the known polyketide in addition to the common alphanumeric symbol or continuous sequence of alphanumeric symbols identified from step (c). This principle is clearly illustrated in Examples 3 and 4 (especially paragraphs [83]-[86] and [88]-[94]).

The first alphanumeric string recited in claims 14 and 19 represents the monomer sequence of a desired (target) polyketide. The second alphanumeric string recited in claims 14 and 19 represents the monomer sequence a known polyketide from the coded polyketide library (see, e.g., Example 2 on page 26 and the table on pages 27-34, as well as Figures 6A-6AJ.) As explained in great detail in paragraphs [60]-[65] and Examples 3 and 4, the first string representing the target polyketide is serially compared with each of the second strings in the database to identify those

known polyketides that contain one or more of the same monomers as the target polyketide. The greater the overlap between the first string (target polyketide) and the second string (known polyketide), the better. Preference is given to those second strings that have the greatest overlap with the first string (preferably, 2, 3, 4 or even 5 consecutive monomers).

The result of such serial alignment is illustrated in paragraphs [84]-[86] and [89]-[94] and typically comprises the name of the known polyketide that has one or more common monomer(s) with the target polyketide, followed by the alphanumeric symbols representing the common monomer(s). This result is what claims 14 and 19 refer to as a "third string". A person skilled in the art would easily recognize that the name of the known polyketide corresponds to the name of the polyketide synthase (PKS) that naturally produces it (e.g., tedanolide in paragraph [84] corresponds to tedanolide PKS, whereas aldgamycin corresponds to aldgamycin PKS), whereas the common monomer(s) following the name of the known polyketide is/are indicative of particular module(s) of the PKS enzyme that is/are involved in making and/or attaching that monomer. Accordingly, the "third strings" illustrated in paragraphs [84], [86], [89] and [91]-[94] of the specification contain all the information required to design and produce a PKS gene encoding a PKS enzyme capable of producing the target polyketide, namely the order, names and modules of the known PKS enzymes.

In view of the foregoing, Applicants believe that claims 14 and 19 as amended satisfy the requirements of 35 U.S.C. § 112, second paragraph and respectfully request that this rejection be withdrawn.

CONCLUSION

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue. If it is determined that a telephone conference would expedite the prosecution of this application, the Examiner is invited to telephone the undersigned at the number given below.

In the event the U.S. Patent and Trademark office determines that an extension and/or other relief is required, applicant petitions for any required relief including extensions of time and authorizes the Commissioner to charge the cost of such petitions and/or other fees due in connection with the filing of this document to **Deposit Account No. 03-1952** referencing docket no. **300622005500**. However, the Commissioner is not authorized to charge the cost of the issue fee to the Deposit Account.

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